First Record of an Australian Fur Seal (*Arctocephalus pusillus doriferus*) Feeding on a Wobbegong Shark (*Orectolobus ornatus*)

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The Australian fur seal (*Arctocephalus pusillus doriferus*) is listed as a 'vulnerable' species in New South Wales (NSW) under the Threatened Species Conservation Act, recovering from exploitation by commercial sealing activities around southeastern Australia. Recent dietary studies indicate they are generalist predators that feed on a wide variety of both vertebrates (fish and, occasionally, birds) and invertebrates (cephalopods and, occasionally, crustaceans). While a small number of elasmobranchs have been reported from the diets of a variety of fur seal species, no published evidence exists of either fur seals preying on wobbegongs (*Orectolobus* spp.), or of large wobbegongs as prey items in the diet of any predator. Here we describe an account of an Australian fur seal feeding on a large ornate wobbegong (*Orectolobus ornatus*). Wobbegongs are also listed as 'vulnerable' in NSW by the IUCN, with commercial fishing catch having dropped over 50% from 1990-2000. Knowledge of relationships between high trophic level species is important for assessing interactions between marine mammals and fisheries and also presents interesting challenges for the conservation of commercially targeted species.

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INTRODUCTION

The diets of Australian and New Zealand fur seals (*Arctocephalus pusillus doriferus* and *A. forsteri*, respectively) have been extensively studied around southeastern Australia and New Zealand in the last decade (e.g. Gales & Pemberton 1994; Fea et al. 1999; Littnan 2004). Diagnostic techniques have primarily involved faecal and regurgitate sampling, while more recent work has also included stable isotope and fatty acid analyses (Littnan 2004). These studies have indicated that fur seals target a large number of prey species, with a relatively limited number of cephalopods and fish species constituting the majority of their diet. There is evidence of some seasonal and spatial variation in Australian fur seal diet (Hume et al. 2004; Littnan 2004) and seasonal variation in New Zealand fur seal diet (Fea et al. 1999). A very small portion of fur seal diet is made up of crustaceans, birds and some small elasmobranchs (Gales & Pemberton 1994; Fea et al. 1999; Hume et al. 2004). Here we describe the first account of an Australian fur seal feeding on a large ornate wobbegong (*Orectolobus ornatus*).

INTERACTION ACCOUNT

During a coastal survey of small cetaceans from Port Stephens to Sydney on December 28th 2003, an Australian fur seal (distinguished from the sympatric New Zealand fur seal by facial profile and fur colouration) was witnessed carrying the body of a large ornate wobbegong (distinguished from the sympatric spotted wobbegong *O. maculatus* by skin pattern and colouration). The interaction occurred approximately 3.2 nautical miles north of Norah Head lighthouse on the central coast of New South Wales (33°13.3′S, 151°35.2′E). Excellent conditions (Sea State 1, no cloud cover, clear water and being able to approach to within 5m of the animals) facilitated reliable identification of both species, with video footage of the event used to confirm identification and behaviour after the voyage. The shark's head had been removed and the fur seal was thrashing the body from side to side in an apparent attempt to separate manageable portions of the shark's flesh. This behaviour is common for pinnipeds feeding on prey too large to swallow (Rand 1959; Reeves et al. 1992).

Female Australian fur seals grow to a maximum length of around 1.5m, while males can reach 2.0-2.25m (Warneke and Shaughnessy 1985). The fur seal was estimated to be approximately 1.5m in length and the presence of a light mane suggested it was a sub-adult male. The ornate wobbegong becomes sexually mature at around 1.8m in length and grows to 2.9m (Last and Stevens 1994). The wobbegong's total body length was estimated to be around 1.4m (sex was not determined).

Only post-capture manipulation was witnessed, with no predation event observed, so we cannot discount the possibility that the shark was found dead or was scavenged from a fishing line by the fur seal. Wobbegongs are, however, commercially targeted using set-lines in NSW; 89% are gut-hooked, 100% remain alive until retrieved and killed by fishermen, and no wobbegong fisherman in NSW have witnessed line depredation by fur seals (C. Huveneers unpub. data). It is unlikely that a carcass would be discarded by a fisherman or that the shark could have been removed from the hook by the fur seal without tearing the shark's body cavity. Predation thus seems to be the most plausible explanation for the above observation of an Australian fur seal carrying the body of an ornate wobbegong.

ELASMOBRANCHS IN FUR SEAL DIET

The remains of two spiny dogfish (*Squalus acanthias*) were found in 357 faecal and regurgitate samples of Australian fur seals hauling out around Tasmania (Gales and Pemberton 1994), while a more recent study of the same colonies found no elasmobranch remains in 1044 samples (Hume et al. 2004). Similarly, no sharks or rays were found in the diet of Australian fur seals around Kanowna or the Skerries, Victoria (n=1008; Littnan 2004). The remains of one dogfish were found in 584 faeces and regurgitates from New Zealand fur seals at the Otago Peninsula (Fea et al. 1999) and elasmobranchs including the puffadder shyshark (*Haploblepharus edwardsii*) have been recorded in the diet of the Cape fur seal (*A. p. pusillus*) off South Africa (Rand 1959; Martin 2004). Adult wobbegongs might be considered potential prey items for numerous pinnipeds, cetaceans and large shark species, but there has been no published account to date.

CONCLUSION

Pinnipeds and elasmobranchs are high-level predators that occupy important niches in marine ecosystems (e.g. Cortes and Gruber 1990; Read and Brownstein 2003). Interactions between them can have both direct and indirect effects on marine mammals, fish and invertebrates at lower trophic levels. Quantifying the diet of high trophic level species is therefore important for modelling of interactions between marine mammals and fisheries and assessing the effects of stock depletion by commercial fishing (see Goldsworthy et al. 2003; Myers and Worm 2003; Hutching and Reynolds 2004; Littnan 2004). It also presents challenges for conservation and fisheries management when predator/prey relationships involve more than one threatened or vulnerable species. This note represents the first record of a large wobbegong being fed upon by a fur seal.

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